PNW Ecotone—Episode 1: "Scarred for Life: What Tree Rings Can Reveal About Fire History"

Total running time: 6:09

[Guitar and bassoon intro music]

[Sound of footsteps walking through a forest]

Yasmeen Sands: From the Pacific Northwest Research Station, this is "PNW Ecotone."

Have you ever walked through a forest and found yourself wondering what secrets the long-lived trees might hold?

A forest's age, condition, and, even, species composition can all tell a story—like how the forest has been managed and how healthy it is. But trees can tell us more—much more, it turns out. Research is showing that scars embedded within the annual growth rings of trees can be valuable in accounting for historical fires—and in planning for future ones.

Here's research ecologist Don McKenzie, with the station's Pacific Wildland Fire Sciences Laboratory in Seattle…

Don McKenzie: Fires burn through a forest or a woodland and they'll do one of three things—they'll miss a tree entirely or they'll burn the tree very badly and, often, kill it. Sometimes they'll burn the tree, the fire will go through on the surface and it won't be severe enough to kill the tree, but it will actually leave a mark on the tree, it will actually char some of what corresponds to the flesh of the tree and that will often leave a scar.

People discovered that if you dug down below the scars, that you could see there were sometimes other scars. That led to the idea

that, hey, we can look back in time because trees are nice enough to provide annual rings most of the time - we could look back in time and see when fires happened. And if we look at enough trees, then we'll have a record of fire scars over an entire landscape …"

Yasmeen Sands: For decades, fire scars have served as fire history proxies, offering insight on the timing and extent of fires long ago—sometimes as far back as several hundred years or more.

Because scars appear in tree rings, scientists look for them within tree trunks, by removing cross-sections of wood or thin, pencil-sized cores. To determine the calendar year a scar was formed—and, by extension, when the fire that caused it occurred—scientists use a process known as "crossdating," which helps them tease out growth abnormalities that otherwise might skew their estimations.

Here in the Pacific Northwest, McKenzie has been working with a set of fire-scar records first assembled in the 1990s by a forward-thinking field crew with the station's Wenatchee Forestry Sciences Laboratory. The crew didn't know it at the time, but by recording the location of individual trees they sampled along with information on their fire scars, they made it possible for researchers like McKenzie to study not just when past fires occurred, but where, exactly, on the landscape they burned.

Don McKenzie: As far as I know, at least in the U.S., and at least in the West, this is the only data set of its kind where you have these spatially explicit records, because most fire history data sets composed of fire-scarred trees were developed and were sampled for different purposes.

What you have with fire scars is what we call a "deep temporal record." "Deep" meaning it goes into the past a long way beyond

what we have any observational records of … Not only do we have a record that goes back in time, but it also, is very, in our particular data set, is very explicit in space, and that's that every place there is a fire scar on a tree, we know there was a fire in that particular year; and if we have patterns in those trees in a particular year, we can more or less deduce the spatial pattern of the fire.

Yasmeen Sands: These records are part of a steadily expanding fire-scar network that spans the inland Northwest. McKenzie is using this network to explore a range of research topics, from the relationship between big fires and past climate to regional comparisons of fire history in collaboration with colleagues in the Southwest.

Don McKenzie: We have an uncertain but a more or less unbiased view of what years were hot and what years were cold, for example, what years were dry, what years were wet, and if we match those time series of climate records that have been reconstructed from tree rings to the fire scar record … then you match up the climate to the fires statistically in various ways to figure out what the relationship is between fire and climate in your system. That'll tell you a lot about the fire regime itself, but mostly it'll tell you what are the drivers, what are the climate drivers of fire.

Yasmeen Sands: Outcomes of McKenzie's fire-scar network research may provide a glimpse of what future fires may be like in the Pacific Northwest, amidst a warming climate.

Don McKenzie: The fire regime that we're seeing and all these cross-scale relationships that we're seeing are something that are tied to that little Ice Age and afterward climate, and we expect them to break down in a climate where it's warming. We know they're going to, and how they break down has big implications for management because it suggests what sorts of controls on

wildfires are no longer going to be in place as the climate warms ... where that happens may be a function of some of the parameters that we're able to discover in this cross-scale analysis that we're doing, in a way that you can't really do by running fire behavior models.

Yasmeen Sands: "PNW Ecotone" is produced by the U.S. Forest Service's Pacific Northwest Research Station, which is solely responsible for its content. For "PNW Ecotone," I'm Yasmeen Sands.

[Guitar and bassoon outro music]